GOLD

ME215: Thermodynamics I
Test One, 26 September 2018

Closed book. Closed notes. No formula sheet. All test materials needed are in this packet.
No Internet or communication allowed. Calculator is allowed.
100 points

Write your final answers on this problem sheet **AND** make sure your final answers are **clearly identified** in your work. Make sure you turn in **ALL** of your work sheets.

1. **(15)** A room contains a refrigerator. On a particular day, the refrigerator consumed 0.p8 kWh of electricity while removing 1800 kJ of heat from its contents. For that day, what was the net energy change of the room [kJ]?

2. **(10)** Explain the differences between open, closed, and isolated systems.

3. **(15)** A 1.5-kW electric resistance heater in a room is turned on and kept on for 20 min. Calculate the amount of energy transferred to the room by the heater [kJ]

4. **(20)** The difference in atmospheric pressure from the base to the summit of a mountain is equivalent to a manometer reading of 38 inches H_2O. Assuming the average specific volume of air is 12.8 ft^3/lbm, the density of water is 62.4 lbm/ft^3, what is the height of the mountain [feet]?

5. **(10)** The density and the specific volume of a simple compressible system are known. The number of additional independent properties needed to fix the state of this system is

   (a) 0 **(b)** 1 **(c)** 2 **(d)** 3 **(e)** None of the above

6. **(10)** Identify the **extensive** properties in the following list:

   (a) temperature **(b)** volume **(c)** internal energy **(d)** pressure

   (e) None of the above

7. **(20)** Ninety-nine (99) thermodynamics students are locked in a room to take an exam. The room is 15 meters wide by 20 meters long by 10 meters tall. The ceiling/roof is a frictionless piston that maintains pressure in the room at a constant 100 kPa. Each student releases heat at a rate of 110 W for the hour-long test.

   Consider the energy released into the room by the students. If one third is lost through the walls, and one third increases the energy of the room itself, how much will the students raise the roof [m]?

WRITE NEATLY. IF I CAN'T READ IT, IT'S NOT THERE.